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ON THE CARE OF MAMMAL SKINS KEPT FOR MUSEUM PURPOSES.

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THIS paper is in part an answer to, or at least was suggested by, numerous inquiries, by letter and otherwise, concerning the proper methods of caring for the larger mammal skins for museum purposes. The writer has been handling mammal skins in one form or another since he was a boy, and has been trying to tan, cure and preserve them for more than forty years.

When a boy I tanned skins by rubbing salt and alum on them and then folding and rolling them up so that the two halves of the fleshy part of the skin would stick together. After a week or ten days the skins were opened up; the flesh and fat being scraped off, they were rubbed until they were soft and dry. It took more or less hard work but the results were not bad. It so happens that I still have an opossum skin that was tanned nearly forty years ago. It was made into a little rug and has seen considerable service on the backs of chairs, and yet it is in better condition now than some skins that I have handled in more recent years by some newer and supposedly better methods. A squirrel skin that was tanned about the same time is in much better shape than the opossum. The squirrel skin did not have any grease in it. The opossum skin evidently had some grease left in it, though it did not show at the time it was tanned. The subject of grease in skins will be considered later on in this paper.

I want to say, before going any farther, that it is very important that a skin should reach the museum in good condition. It seldom happens that a skin is in good shape that has been taken from the body of an animal that has died from some kind of disease. The hair on such a specimen will usually slip in places while the skin is being dressed and tanned. An animal that has begun to decompose—even though slightly—before the skin is removed, usually furnishes a doubtful skin.

The good skins that come into a museum are those that have been taken from animals that have been shot or trapped and cared for by experienced collectors; and I might say farther that these are about the only first-class skins that ever do reach a museum. Many skins are sent in by inexperienced persons who are more or less interested in specimens for museum purposes. Such skins reach the museum in every conceivable condition. As a rule they

are covered with more or less blood and dirt, with feet and head only partially skinned and spoiling.

Whole animals are not unfrequently sent to the museum. In cool weather this sometimes proves more successful in the hands of the inexperienced than sending the skins in a mutilated condition without measurements or any bones to take measurements from.

The skins for museum purposes should be cured as soon as they are removed from the bodies of the animals. In the field the writer usually cures skins by rubbing plenty of salt on them.

The feet of all animals with toes, such as bears, beavers and foxes, should be skinned down to the very bases of the toe-nails, and animals with hoofs, like the ox and the deer, should not only have their feet skinned down to the very hoofs, but the hoofs should be skinned loose from the toe bones that fit in them, and then, to make sure that everything is right, remove the toe bones from the feet as soon as the skins reach the museum. The ears should be skinned to their very tips on the back side of the cartilage and turned inside out. Leave the cartilage adhering to the inside ear skin to protect it until the skin is ready to be mounted. Then it should be skinned out. The mouth and nose should be carefully skinned, saving one-half inch or more of the skin of the inside lips; all fat and meat should be removed from the lips and nose without cutting or injuring the skin.

The writer has cured skins in different climates by the use of salt alone. It should be rubbed onto every part of the skin, particularly the edges, around the mouth, ears and tail, until the skin is saturated with salt brine. Skins should be dried and folded so far as possible in the shade. While salt alone will do to cure skins with temporarily, yet when I have it at hand I prefer to mix a little alum with it, particularly in warm climates. The use of alum tans and hardens the skin a little and makes it hold its hair better. Some collectors use a little arsenic with the salt and alum while collecting in the field. It does no harm, and is good to keep flies away from skins in warm weather. The writer seldom uses arsenic except on the skins of the smaller mammals. To immerse the skin of a large mammal in a bath of salt and alum brine for two or three days gives the most satisfactory results. While collecting in the field a hole made in the ground the size and shape of an ordinary bread-pan will do. Spread the skin over this hole. Press a part of the body skin, flesh side up, down into the basin. Mix the brine in it and fold the head and feet of the skin into this basin. Move the head and feet around in the basin once or twice a day. Most

of the skins that I have collected in the field were cured in such an improvised tan-vat with good results.

SKINS IN THE MUSEUM.

At the University we look over skins as soon as they reach the laboratory, wash those that are dirty, and place them in tan-liquor for immediate safe-keeping. After a few days they are examined and moved about in the tan-vats. As soon as we are ready to work upon the skins they are hung on poles, a few at a time, over the tan vats and allowed to drain until the tan-liquor ceases to drip from them. Then they are taken to the laboratory, where they are redressed. To dress the skins they are spread over half-round timbers, or tanners' fleshing beams, and shaved and scratched with various kinds of knives and scrapers, the hack-saw being one of the useful tools used. Thick skins, like those of the walrus or the necks of such animals as the elk, moose or buffalo, are shaved until they are thin and of an even thickness. All bones are removed from the feet of the skins except the bones that fit in the claws of such animals as the fox, beaver or bear. I have learned from experience that it is dangerous to leave even a small toe bone in any kind of a skin, especially of the larger mammals. In time, if the skin has been dried, grease may come out of the bone and stain or rot the skin. If the skins are kept green in tan-liquor this may not occur, at least for several years.

TAN-LIQUOR.

Museum men and taxidermists are not agreed upon what constitutes the best tan-liquor. Some advise using nothing but salt brine. I have tried salt brine for ten years, but not with the best success. It sometimes allows skins to get "slippery," so to speak. Some use salt brine with sulfuric acid in it—even as much acid as an ounce to a gallon of brine. My experience has gone to show that this is too much acid for museum skins. It seems to destroy the fiber of the skins, particularly if the skins are left in it very long. Skins kept for one year in such a tan-liquor were very tender. A little acid—say one ounce to ten gallons of salt brine—enough to keep it sweet, so that it would not get slippery, might do; but I prefer to use a little alum in the tan-liquor and leave the acid out altogether, especially where skins are to remain green in tan-liquor for several years. Where skins are to be tanned for rugs, they may be placed in a salt and alum tan-liquor that has from one-half to one ounce of sulfuric acid in it. However, skins should not be left in such a solution for more than from one to three weeks, depending upon kind and thickness of skins.

My old standby for a tan-liquor, which I have used at the University for the past thirty years, has been made of salt and alum. Five quarts of salt and one quart of alum to five gallons of water make a tan-liquor that has kept individual skins in good shape for over twenty years. After making a barrel or tank of this liquor, it is usually tested with a hydrometer for a reading of about 15 on the index scale, which gives about a 15-per-cent. solution.

This is about the strength we use for the permanent keeping of skins. However, a saturated solution will not harm a skin if it is not left in it too long. Sometimes fresh skins are placed in a very strong solution, half salt and half alum, particularly if the skins show some signs of decay. If skins are left for a year or more in strong brine, the epidermis about the hoofs and claws is more or less damaged.

Last year we mounted some skins that had been in this standard tan-liquor for twelve years. They were in good shape and worked well, but, of course, were not so elastic as fresh skins. We are now mounting some that have been in tan-liquor and some that have been kept dry for over twenty years. These skins have some defects which will be explained now in this paper, under the heading of "Grease."

GREASE.

The one thing that has caused more trouble, and which, I think I am safe in saying, has destroyed more museum skins than all other agencies combined, is grease. If there is grease in a skin, sooner or later it will go to the bad. Some skins, like those of the deer or antelope, have very little grease in them. Others, like those of the bear, skunk, wolf, lynx and seal, are full of grease, and it is with great difficulty that it can be removed.

Over twenty years ago I packed away for experiment in a dry condition some antelope, deer and sheep skins that had been thoroughly dressed and cleaned according to the best methods then known for doing such work. The main body parts of these skins are in very good condition.

The skins were folded in rectangular packages with head, feet and hair side of skins on the inside of the bundles. In a number of cases where the toe bones came in contact with the fleshy sides of the skins there are greasy and rotten places, caused by the grease that exuded from the bones. The skin around the feet that contained these bones is more or less injured. The noses on some of the skins that did not have all the grease worked out of them are tender and not much good.

I have finally come to the conclusion, after many years of pains-

taking care and labor in trying to take good care of museum skins, that it does not make much difference what is done to a skin, it will not keep—even for a short time—if dried, unless the grease is all worked out of it; and to get all of the grease out of fat skins is quite a serious proposition. No sure cure method can be given. In practice at the University Museum about everything we ever heard of other people doing, or could think of ourselves, has been tried.

As soon as skins reach our laboratory we begin to figure on how to get the grease out of them. After as much of the fat and grease has been removed as possible by the use of knives and scrapers, if the skin is very greasy it is washed with warm soapsuds made from good laundry soap and soapine. Sal soda is sometimes used. After a skin has been washed by using sal soda it ought to be rinsed pretty well, as sal soda seems to bleach the hair of some animals if allowed to dry in it. After this washing the skins should soon be returned to the tan-liquor bath to prevent the hair from slipping. In two or three days the skins may again be taken from the tan-liquor and hung upon poles, hair side out, to drip.

When the hair begins to dry on the outside and is still wet next to the roots, the skin is ready to be placed in a benzine bath. From one to twenty gallons may be used on a single skin, depending of course upon its size. Skins are usually left in benzine from one to twelve hours. A fat bear skin will stand twelve hours' soaking without injury if the weather is cool. If weather or room is warm, half that time would be sufficient. Leaving it in too long might cause the hair to slip.

After this bath the skin should be removed to a platform that will allow the benzine to drain back into the jar or tank.* The skin should now be squeezed and pressed so as to remove as much of the benzine as possible. Then the skin, while the hair is still wet with the benzine, should be immediately dried in corn-meal, plaster or sawdust. If the skins are small, as those of opossums or civet cats, they may be dried in a tray of corn-meal or plaster by covering the skins with the meal or plaster and rubbing the material into the hair and shaking it out, repeating the operation many times, until the skins are dry and the hair clean and fluffy. In my laboratory at the University there is a large tanner's wheel, seven feet in diameter and two feet wide. A bushel of meal or plaster is placed in the wheel with a number of skins. The door is tightly closed with bolts and the wheel started in slow motion and allowed

* There should be no fire, gas-jet burning, or match lit anywhere near where these benzine skins are being worked.

to run for hours. This is a very satisfactory method of cleaning and drying skins.

Plaster of Paris is a good cleaner and drier for a skin after it has been in benzine, but it is hard to work plaster out of the hair, especially of a dark-colored animal. To get plaster, corn-meal or sawdust out of a large skin, it may be hung upon a pole in the sunshine and wind and beaten thoroughly with riding-whips. A piece of small rubber tubing on a handle sometimes answers the purpose. This is about the only way it can be done successfully unless one has compressed air, which can be used with the very best effect. If one benzine treatment does not do the business, a second or even a third one may be given.

After scraping and washing some fat polar bear skins until the entire museum force had worn itself out, we spread them on the floor, flesh side up, between two doors where we were accustomed to do a good deal of tramping, and covered them with three or four inches of sawdust. We walked over them more or less for a month, and the treatment aided very much in removing the grease from the skins. At that time we did not make such general use of benzine for cleaning fat skins as we do now, and did not have a tanner's wheel or compressed air in the taxidermic laboratories.

If skins of the larger mammals are to be mounted, my experience has been that they had better be kept green and soft in tan-liquor and never allowed to dry; and I might say farther, that the sooner they are mounted after they have been cleaned and tanned the better they behave themselves. When skins have been kept dry for a number of years they seem to lose their life, so to speak. They have very little elasticity, and it is hard to make them assume their original shape on a well-formed statue. Skins that have grease in them can be kept much better green and soft in tan-liquor than in a dried condition. If such skins are taken out of the tan-liquor and dried the grease in them soon burns them and they get rotten. Skins that have been thoroughly cleaned and freed from grease can be dried and put away for safe-keeping. They should be kept in moth-proof cases and in as cool a place as possible. The flesh side of the skin may be poisoned with arsenic so that insects will not eat it, but this does not always save the hair. As a rule "moths" will not bother the hair of a skin that has been soaked in tan-liquor and allowed to dry with a light deposit of the salt and alum on the hair. We have kept skins over twenty years in the University museum in this condition that were not protected by moth-proof cases, and they have not been disturbed by any skin-eating insects.